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Risk selection and cost shifting in a prospective physician payment system: Evidence from Ontario

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ABSTRACT

We study the risk-selection and cost-shifting behavior of physicians in a unique capitation payment model in Ontario, using the incentive to enroll and care for complex and vulnerable patients as a case study. This incentive, which is incremental to the regular capitation payment, ceases after the first year of patient enrollment and may therefore impact on the physician's decision to continue to enroll the patient. Furthermore, because the enrolled patients in Ontario can seek care from any provider, the enrolling physician may shift some treatment costs to other providers. Using longitudinal administrative data and a control group of physicians in the fee-for-service model who were eligible for the same incentive, we find no evidence of either patient 'dumping' or cost shifting. These results highlight the need to re-examine the conventional wisdom about risk selection for physician payment models that significantly deviate from the stylized capitation model.

1. Introduction

Understanding how primary care physicians respond to payment incentives has been at the center of many recent health care reforms because of its important consequences for the cost and quality of health care (see e.g. [12,16,18,20]). In recent years, a prospective payment model, in which physicians receive a fixed amount for each patient, has become a particularly popular way to pay physicians. In comparison with the traditional fee-for-service reimbursement, in which physicians are paid for each service they provide, this model has attractive cost-reducing properties because it induces physicians to internalize the cost of treatment (see e.g. [12,20]). Furthermore, the model can enhance the quality of care, provided that the patient demand is sufficiently responsive to differences in provider quality (see e.g. [6,7,15]) or that the providers are sufficiently altruistic (see e.g. [3]). However, the main problem with the prospective payment models is that physicians may preferentially enroll patients based on the expected cost of their treatment (see e.g. [4,19,20]), which may limit access to care.

Despite the extensive literature on risk selection (see e.g. [4,19]), however, the evidence for payment models that deviate from the stylized capitation models is still relatively scarce. In this paper, we provide new evidence relating to this question by studying risk selection in a unique capitation model for primary care physicians in Ontario (for empirical evidence on other aspects of this model, see e.g. [10,11,14]). This model is a blend of capitation, partial cost reimbursement, and an ex-post fund designed to align physician incentives in an environment in which the

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[2] The views expressed in this paper are strictly those of the authors. No official endorsement by the Ontario Medical Association is intended or should be inferred.

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enrolled patients are not restricted to seeking care from their enrolling physician. In this model, the ex-post fund penalizes physicians whenever their patients seek care elsewhere. However, because the size of this penalty is limited, the model provides physicians with both a degree of risk insurance and an opportunity to shift costs to other providers, two features that are typically not present in the standard prospective payment models. Therefore, it is interesting to examine whether the well-known results about the risk selection in capitation models also apply to the unique model in Ontario.

The question is also of policy importance, as the policy debate in Ontario centers around the conventional wisdom that applies to standard capitation models, without recognizing the distinct features of the Ontario's model that may affect its conclusions and policy implications. For example, in the 2011 Annual Report by the Office of Auditor General of Ontario, the Auditor reports that, at the time of their audit fieldwork, "the Ministry had not monitored whether any of these [hard-to-care-for] patients are de-enrolled by their physicians once the short-term financial incentives end." The Auditor also recommends to the Ministry of Health and Long-Term Care to "review the number of patients being de-enrolled by their physician to determine whether a significant number of these patients are in the hard-to-care-for category, and, if so, whether the current financial incentive arrangements should be revised." While these concerns about de-enrollment of hard-to-care-for patients arise naturally in the standard capitation models, it is not clear how they apply to the unique capitation model in Ontario.

To study risk selection in this model, we focus on a recently introduced incentive to attach and care for complex and vulnerable patients as a case study (CV incentive henceforth). This incentive provides an ideal setting in which to study risk selection because the incentive is financially significant, up to three times higher than the regular capitation rate, and available only for the first year of enrollment, which provides a strong financial incentive to 'dump' high-cost patients after the incentive ends. Furthermore, the incentive is also available to physicians in cost reimbursement models who should not be affected in the same way or to the same extent by the incentive removal, which provides us with a natural comparison group to contrast with the treatment group of capitation physicians. Lastly, we have access to the longitudinal administrative data for virtually all the enrolled patients in Ontario, which allows us to study risk selection behavior comprehensively over time.

We find that the removal of the CV incentive had no impact on either patient enrollment or cost shifting in the 12 months following the incentive removal. These results hold for various patient demographic groups and for groups differentiated based on the actual treatment costs during the first year of enrollment. We interpret this lack of evidence of risk selection as follows. First, patient selection may be less important when physicians face limited risk and may shift costs to other providers. Second, the cost shifting may be limited in practice by physician altruism and professional ethics and by patient behavior. More generally, these results, which seem to contradict the conventional wisdom, highlight the need to re-examine risk selection for physician payment models that significantly deviate from the stylized capitation model (see e.g. [5]).

The remainder of the paper is organized as follows. In the next section, we describe the payment models for primary care physicians in Ontario and the incentive to attach and care for complex and vulnerable patients. We also discuss the potential impact of the removal of this incentive on patient enrollment and the share of the cost borne by the enrolling physician. In Sections 3 and 4, we describe our empirical methodology and data. We then discuss our results in Section 5 and conclude in Section 6.

2. Institutional background and expected impact

2.1. Physician payment models in Ontario

Primary care physicians in Ontario practice in a wide spectrum of payment models (see e.g. [10,11,14]). These models are either enrollment-based (about two-thirds of physicians) or non-enrollment-based (about one-third of physicians). The enrollment-based models, in which patients are formally attached to their primary care physician, were introduced as part of a major health care reform in Ontario over the last decade. These models can be further divided into harmonized and non-harmonized models, based on how physicians are paid for their services.

The non-harmonized models are retrospective payment models, whereby the physician receives the full fee-for-service value for the services provided to their patients. The physician also receives a 10% premium for providing selected comprehensive care services and a 20% premium for services provided after hours. In contrast, the harmonized models are prospective payment models in which the physician compensation consists of three main parts. First, the physician receives a fixed amount for each enrolled patient ('the net capitation rate'). This amount is paid in lieu of providing a specific set of comprehensive care services ("the basket"), in which the value of the basket was calculated separately for 38 age–sex groups based on the historical fee-for-service data. The net capitation rate consists of this basket value, net of the estimated share of basket services that the patient receives from other providers. In the Family Health Organization (FHO), the most popular harmonized model that comprises about one-third of all primary care physicians, the basket includes over 100 comprehensive care services and the estimated share of basket services that the patient receives from other providers is 0.1859. The average net capitation rate in fiscal 2011/12 was about C$143 (the value of about 4.5 regular visits), ranging between C$63 (males, age 10–14) and $511 (females, age 90+). Second, the physician receives a discounted value of fee-for-services claims for basket services provided to enrolled patients ('the shadow billing premium'), so that the physician is partially reimbursed for the actual cost of treatment. Lastly, the physician is also eligible for an additional payment ('the access bonus') every six months if the basket services that the patient receives from other providers do not exceed a given threshold. Specifically, the access bonus is calculated as the difference between the 'maximum special payment' and 'the outside use' (or zero if this difference is negative), where the maximum special payment and the outside use represent, respectively, the estimated and the actual value of basket services that the patient receives from other providers. The average access bonus in fiscal 2011/12 was about C$33 per patient, ranging between about C$14 (males, age 10–14) and C$117 (females, age 90+).

Formally, the payment per enrolled patient in the harmonized models can be represented as:

$$P = \gamma E[C] + \delta\lambda C + \max[0, (1-\gamma)E[C] - (1-\lambda)C]$$

where C and $E[C]$ represent the actual and the expected cost of treatment, δ is the shadow billing rate, and λ and γ are the actual and the estimated share of treatment costs provided by the enrolling physician. In this expression, $\gamma E[C]$ is the net capitation rate, $\delta\lambda C$ is the shadow billing premium, $(1-\gamma)E[C]$ is the maximum special payment, $(1-\lambda)C$ is the outside use, and $\max[0,(1-\gamma)E[C]-(1-\lambda)C]$ is the access bonus.

While this payment model may seem non-standard, it can be interpreted as a variant of a blended capitation model in an environment in which the patient is not limited to seeking care from her enrolling provider only. To see this, note that when the patient can seek care only from his enrolling physician ($\lambda=1$), the payment reduces to $P=E[C]+\delta C$, i.e. the capitation payment plus partial cost reimbursement. However, when the enrolled patient can seek care from any provider, the enrolling physician may have perverse incentives to shift the treatment costs to other providers. This problem could be addressed by penalizing physicians whenever their enrolled patients seek care elsewhere, provided that the penalty is sufficiently small to make the contract still acceptable to the physician. This solution can be implemented, as in Ontario, as an upfront payment (e.g. the net capitation rate) and an ex-post fund that accounts for the costs incurred by other providers (e.g. the access bonus).

2.2. Incentive for caring for complex/vulnerable patients

Except for the payment method, the harmonized and non-harmonized models are identical in almost all other aspects, including the eligibility for the complex/vulnerable (CV) incentive. This incentive for attaching and caring for CV patients with no regular family doctor was introduced on April 1, 2009. The identification of CV patients uses a scoring methodology that assesses patients based on their self-assessed health status, number of chronic conditions or health problems, activity-limiting disability, mental health, and obesity. These factors were derived from Hutchison et al.'s [8] study of the determinants of primary care use in Ontario. Patients scoring seven or more points (out of the maximum of nine points) are deemed CV. The patient assessment is conducted by Health Care Connect, an organization affiliated with the Ministry of Health and Long-Term Care. Importantly, the physicians cannot directly designate patients seen in their offices as CV patients. Patients identified as CV patients are then referred to physicians registered with Health Care Connect.

The CV incentive consists of two parts: the unattached patient fee and the enhanced payment. The unattached patient fee is a one-time fee of C$350 paid at the time of enrollment. In contrast, the enhanced payment depends on whether the enrolling physician is in a harmonized model or a non-harmonized model. For physicians in the harmonized models, the enhanced payment is C$500, in addition to the regular capitation rate. This is quite a significant financial incentive given that the regular gross capitation rate for an average enrolled patient in Ontario is only about $175, or about three times smaller. For physicians in the non-harmonized models, the enhanced payment is a 50% premium for all fees billed applicable to these patients.

Importantly, the enhanced payment ceases after the first twelve months of enrollment for all physicians. After that, physicians in the harmonized models receive the regular capitation rate, while physicians in the non-harmonized models receive fees paid at the regular rate.

2.3. Expected impact of the CV incentive

Conceptually, the CV incentive is similar to a conventional risk adjustment that compensates physicians for enrolling and caring for patients with high complexity scores. In the absence of this adjustment, physicians may be reluctant to enroll CV patients because the regular capitation payment may not cover the expected cost of the treatment. Therefore, the introduction of this incentive, which is akin to an increase in the capitation rate, is expected to increase the enrollment of CV patients.

What is the expected impact of removing the CV incentive on the patient enrollment and level of services? In a standard blended capitation model, in which the patient can receive care only from the enrolling physician, the physician will face strong financial incentives to de-enroll patients whose treatment costs are above the regular capitation rate but to retain all their other patients. If de-enrollment is permitted in the contract, this can be accomplished by 'dumping' high-cost patients and targeting services for low-cost patients ('cream skimming'). If de-enrollment is not permitted, the physician may 'skimp' on services for high-cost patients to encourage them to leave. Therefore, in the standard blended capitation model, the removal of the CV incentive may decrease patient enrollment and increase the services provided to low-cost patients relative to high-cost patients.

In contrast, the removal of the CV incentive may have no impact on patient enrollment in a blended capitation model in which the patient can seek care from any provider. In fact, the physician may benefit from continuing enrollment of any type of patients if he can shift costs to and from other providers. For example, if the physician can shift the entire cost ($\lambda=0$) for patients with no potential access bonus, he would receive a payment of the net capitation rate, which is positive. Similarly, if the physician can provide all services ($\lambda=1$) to patients with the potential positive access bonus, he would receive a payment of the gross capitation rate plus the shadow billing premium, which is again positive. Therefore, in the blended capitation model with no restriction on where the patient receives care, the removal of the CV incentive may have no impact on patient enrollment, but may impact the share of the cost borne by the enrolling physician.

The possibility of cost shifting is based on at least three assumptions that may be violated in practice. The first assumption is that the physician is purely self-interested. If the physician is partly altruistic, or has sufficiently strong professional ethics, he may choose not to shift costs to or from other providers even if he is able to do so. The second assumption is that the physician is perfectly able to determine where his enrolled patients receive care. This assumption may not be realistic given that patients in Ontario can obtain care from any provider at no additional financial cost. The last assumption is that patients do not respond to the low level of care by terminating their enrollment, which again seems a rather strong assumption. If any of these assumptions are violated, the physician may not engage in significant cost shifting. Given that these assumptions are hard to verify a priori, the actual impact of the removal of the CV incentive on the capitation physicians remains an empirical question.

On the other hand, we expect to see no impact on the enrolment decision of the FFS physicians. However, because of the 50% reduction in fees after the first year of enrolment, the FFS physicians may respond by changing the number and type of services provided to their enrolled CV patients. In general, the direction and magnitude of this change is ambiguous as it depends on the opposing income and substitution effects. For example, when the substitution effect is dominant, the number of services provided by the FFS physicians is expected to decrease. If the CV patients can receive services from other providers, this would imply that the share of total services provided by the FFS physicians will decrease. Therefore, both the capitation and FFS physicians may lower their share of total services provided to the CV patients, although for different reasons (cost shifting vs. fee change). In addition, although both types of physicians are exposed to 'treatment', the treatment intensity is much stronger for the capitation physicians. Specifically, the capitation physicians lose $500 after the first year, while the FFS physicians lose 50% of the value of their claims. Given that the average value of claims for the CV patients in our sample was about $300, this means that on average the capitation physicians lose $500 compared to about $150 for the FFS physicians. Therefore, the comparison of impact between the two types of physicians with respect to cost shifting is better interpreted as a comparison of two treatment groups with different treatment intensities rather than the standard treatment-control group comparison. On the other hand, the standard comparison is more applicable with respect to the enrollment decision as the FFS physicians have no incentives to change their decision.

3. Empirical strategy

As mentioned in the previous sections, we wish to examine whether and how physicians in the harmonized models (capitation physicians henceforth) respond to the removal of the CV incentive. A standard approach to this problem is to compare the outcome of interest (e.g. the probability of enrollment, the share of primary care costs) before and after the CV incentive is removed. While this approach concisely summarizes the mean impact of the CV incentive, it is not informative about how the impact evolves over time, which may be important for policy purposes. Conceptually, the impact may be instantaneous (at the 12-month benchmark) or it may be distributed over time, depending on how quickly the physician can adjust her practice. To accommodate both of these possibilities, we initially consider the following model:

$$y_{it}^1 = \beta_0 + \beta_1 Trend_{it} + \beta_2 Trend_{it} After_{it} + \beta_3 After_{it} + u_{it}$$

where y is the outcome of interest, the subscripts i and t index patients and time, respectively, the superscript 1 indicates that the sample includes patients enrolled with physicians in the capitation model, *Trend* denotes the time since enrollment (normalized to equal 0 at 12 months), and *After* is the treatment indicator equal to 1 if the time since enrollment is greater than 12 months and 0 otherwise.

In this model, the term $\beta_0 + \beta_1 Trend$ describes the evolution of the outcome before the removal of the CV incentive as well as the counterfactual evolution of the outcome after 12 months if the CV incentive was not removed. The coefficients β_2 and β_3 indicate whether, after the CV incentive is removed, the outcome deviates from what can be expected based on the historical trend. Specifically, β_3 captures the instantaneous change, at the time the incentive is removed, while β_2 captures the deviation from the expected trend over time. Therefore, this model is suitable for testing whether there was a structural break in the outcome following the removal of the CV incentive, and whether this break was instantaneous or gradual.

The main concern with this model is that the coefficients β_2 and β_3 may capture not only the impact of the CV incentive, but also the impact of all the other contemporaneous changes that affect the outcome of interest, such as changes in government policies or shocks to the patient health condition. Therefore, the outcome may deviate from its historical trend even if the CV incentive has no impact at all on physician behavior. To address this concern, we use a control sample of CV patients enrolled with physicians in the non-harmonized models (FFS physicians henceforth). Arguably, these patients are similar to patients enrolled with the capitation physicians since the two groups of patients have similar complexity scores, as determined by Health Care Connect. In the supplementary analysis, we examined this claim using the propensity score matching. In addition, the FFS physicians who enrolled the CV patients are expected to be similar to the corresponding group of capitation physicians, since both groups of physicians self-selected by signing up with Health Care Connect and agreeing to accept the CV patients. Again, we examined this claim using the propensity score matching. Importantly, however, the FFS physicians faced different or no incentives to respond to the removal of the CV incentive because they are fully reimbursed for their treatment costs. Therefore, the evolution of the outcome in the sample of FFS patients may represent the impact of contemporaneous changes other than the removal of the CV incentive. Comparing the evolution of outcomes between the capitation and the FFS patients may therefore isolate the impact of the CV incentive.

Specifically, the model for the outcome of interest for the FFS patients can be written as:

$$y_{it}^{0} = \alpha_0 + \alpha_1 Trend_{it} + \alpha_2 Trend_{it} After_{it} + \alpha_3 After_{it} + v_{it}$$

where the superscript 0 now indicates that the sample includes patients enrolled with physicians in the FFS model and the coefficients α_2 and α_3 now indicate whether, after the CV incentive was removed, the outcome for the control group deviates from what can be expected based on the historical trend.

The observed outcome of interest, using the sample of both capitation and FFS patients, can then be written as $y_{it} = y_{it}^{1} Capitation_i + y_{it}^{0}(1 - Capitation_i)$, or:

$$\begin{aligned} y_{it} = \\ &\gamma_0 + \gamma_1 Trend_{it} + \gamma_2 Trend_{it} After_{it} + \gamma_3 After_{it} \\ &+ \gamma_4 Capitation_i + \gamma_5 Trend_{it} Capitation_i + \\ &\gamma_6 Trend_{it} Capitation_i After_{it} + \gamma_7 Capitation_i After_{it} + \varepsilon_{it} \end{aligned} \quad (1)$$

where *Capitation* represents the indicator that is equal to 1 if the patient is enrolled with a capitation physician and 0 if she is enrolled with an FFS physician. In this model, the coefficients of interest are γ_7 and γ_6, which measure, respectively, the change in the intercept and the slope of the historical trend line for the capitation physicians relative to the FFS physicians. To the extent that the trend in the outcome for the FFS physicians adequately represents the counterfactual trend for the capitation physicians, the coefficients γ_7 and γ_6 will summarize the true impact of the CV incentive. The identification of this impact can be further strengthened by decomposing the error term as:

$$\varepsilon_{it} = \theta_i + \pi_t + \rho_{it} \quad (2)$$

so that the model also accounts for unobserved but time-invariant patient heterogeneity (θ_i) and common time effects (π_t).

In conclusion, note that the model described in Eq. (1) can be interpreted as a variant of the standard difference-in-difference model, with two groups and two periods, except that our interest lies in estimating the evolution of the treatment effect over time rather than just the mean impact (see e.g. [2,9,17]). Similarly, the model can be interpreted as a variant of the regression discontinuity design, in which the discontinuity occurs at the end of the twelfth month following the enrollment, except that our identification also relies on the availability of the control group and we wish to estimate the treatment effect both over time and at the discontinuity point (see e.g. [13]).

4. Data and summary statistics

The data come from three administrative sources. The Ontario Health Insurance Plan (OHIP) provides information on all physician claims provided during the sample period; the Client Agency Program Enrolment (CAPE) data identify the patient enrollment status and the enrolling physician; and the Corporate Provider Database (CPD) provides the physician affiliation with a primary care model. These data sources can be linked together using the encrypted physician and patient identifiers to produce complete and comprehensive information for all patients enrolled as complex/vulnerable between April 2009 and March 2011.

Over the sample period, 3366 patients were enrolled using fee code Q053, which was introduced specifically for identifying the CV patients in the claims data, of which 64% were enrolled with 375 physicians in the capitation models (Family Health Organizations, Family Health Networks) and 36% were enrolled with 298 physicians in the enhanced FFS models (Family Health Groups, Comprehensive Care Model). We exclude 253 patients who deceased during the sample period and a further 39 patients who had multiple Q053 claims over the sample period (the results are robust to including these 39 patients). This leaves us with a main sample of 3074 patients and about 66,000 patient-month observations.

The average age of the sample CV patients is 56 years and the proportion of females is 58%. In comparison, the average age of non-CV patients, which includes 9,774,269 patients enrolled as of March 31, 2011, is 41 years and the proportion of females is 53%. In addition, the data indicate that the scoring methodology employed by Health Care Connect was successful in identifying patients with relatively high primary care expenditures (PCE), defined as the value of physician claims for comprehensive care services included in the capitation basket. Specifically, for almost all age–sex categories used to risk-adjust the capitation payment, the average PCE in fiscal year 2011/12 was higher for the CV patients than for the non-CV patients.

For the sample patients, we define two main outcomes of interest, measured on a monthly basis up to two years from the enrollment. On the extensive margin, we use an indicator of whether the patient is still enrolled with the same physician who claimed Q053. On the intensive margin, we use the share of PCE provided by the enrolling physician. This outcome is defined only for the months in which the patient had any PCE, whether from the enrolling physician or from other providers, and only during the time the patient was enrolled with the same physician who claimed Q053. The time profiles for these two outcomes, by the type of physician compensation model are presented in Figs. 1 and 2. In these figures, a vertical line 12 months after enrollment indicates the time at which the CV incentive ends.

Fig. 1 shows that the probability of enrollment declines over time for patients enrolled with both capitation and FFS physicians. On the other hand, Fig. 2 shows that the share of PCE is relatively stable at about 60% for both capitation and FFS patients. These time profiles of patient attrition and the share of PCE are quite similar for a random 5% sample of 111,280 non-CV patients. Importantly, there seems to be no apparent break in the time profile of either attrition or the share of PCE at the 12-month benchmark, by patients enrolled with either capitation or FFS physicians. In other words, and somewhat surprisingly, the removal of the CV incentive seems to have no impact on the two margins of physician behavior that we study. In the next section, we

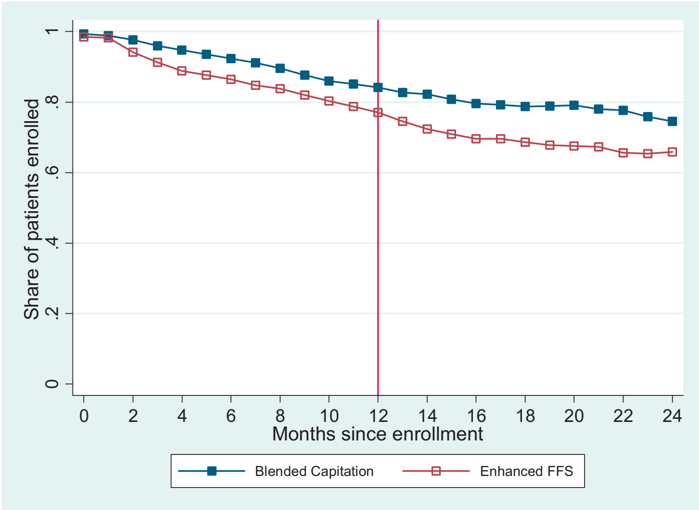

Fig. 1. Probability of remaining enrolled with the same physician, sample of CV patients.

examine this proposition in a more rigorous econometric framework.

5. Results

Table 1 presents the estimated coefficients for our baseline model specified in Eq. (1). The estimates indicate a negative trend in enrollment and the share of PCE for both FFS and capitation patients, even though the trend is relatively less negative for the capitation patients. Importantly, however, there are no statistically significant differences between capitation and FFS patients at the time of removal of the CV incentive and afterwards. Therefore, these estimates suggest that the removal of the CV incentive had no impact, either instantaneous or over time, on the enrollment probabilities or the share of PCE among patients enrolled with capitation physicians. These results are consistent with Figs. 1 and 2, which also showed no evidence of a structural break in the 12-month period following the enrollment.

These results do not seem to be driven by specific demographic groups of patients. Specifically, we estimated the baseline model separately for males and females and for patients above and below 58 years of age, with virtually no impact on our main conclusion of no structural break. Further, the baseline results are robust to the inclusion of a full set of 24 month-specific effects, which may capture the common impact of other factors changing gradually over time.

As a further test, we also estimated the baseline model for the specific groups of patients based on their actual PCE during their first year of enrollment. This test was motivated by the possibility that the enrolling physicians may learn about patient complexity over the course of enrollment, and this updated information may affect their decision to continue to enroll the patients and the level of services provided to these patients. To analyze this possibility, we estimated separate models for patients over and under the average PCE during the first year. In addition, we estimated separate models for patients with outside use greater and smaller than the maximum special payment.

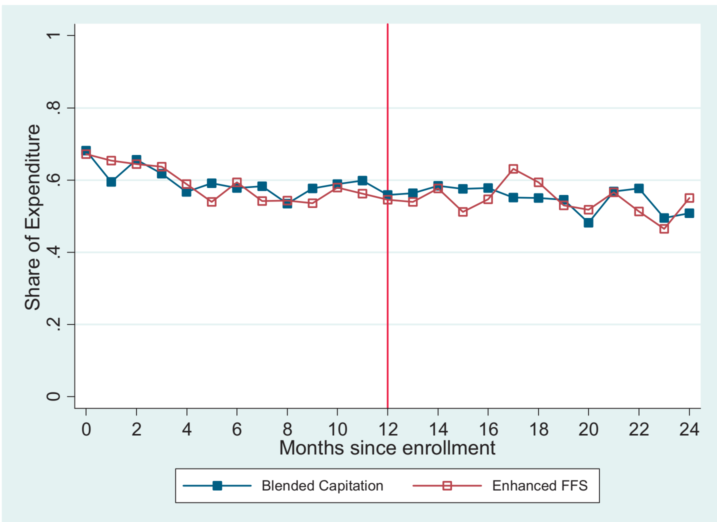

Fig. 2. Share of primary care expenditure by enrolling physician, sample of CV patients.

Table 1
Basic results.

Variable	Parameter from Eq. (1)	Enrollment	Share of PCE
Constant	γ_0	0.8168***	0.6105***
		(0.0034)	(0.0058)
Trend	γ_1	−0.0177***	−0.0129***
		(0.0011)	(0.0014)***
Trend × after	γ_2	0.0069***	0.0080
		(0.0018)	(0.0029)
After	γ_3	−0.0178**	0.0299*
		(0.0077)	(0.0165)
Trend × capitation	γ_5	0.0044***	0.0038**
		(0.0013)	(0.0017)
Trend × capitation × after	γ_6	**−0.0024**	**−0.0020**
		(0.0023)	**(0.0036)**
Capitation × after	γ_7	**0.0129**	**−0.0168**
		(0.0093)	**(0.0211)**
Observations		66,008	26,390
Patients		3074	3006

Notes
Both models also include patient fixed effects. The sample for enrollment includes all the patients enrolled using Q053 in fiscal years 2009/10 and 2010/11, excluding those who deceased during the period or those with multiple Q053 claims, with monthly observations limited to 24 months after the enrollment. The sample for the share of PCE (primary care expenditure) includes the same sample as the enrollment sample, except that it is limited to the months when the patient is enrolled with the same physician who claimed Q053 and provided the patient received any services in the given month. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The coefficient γ_4 from Eq. (1) is absorbed in the fixed effects. Figures in bold represent the main coefficients of interest.

This classification of patients may be relevant because the capitation physicians receive the access bonus payment only for patients with outside use smaller than the maximum special payment. The results, presented in Table 2, confirm our earlier conclusion of no structural break in either enrollment or the share of PCE during and after the 12-month period. Therefore, these results suggest that the enrollment and share of PCE do not vary systematically based on the actual PCE incurred during the first year of enrollment.

We have also conducted three additional specification checks. First, to test whether the results are driven by differences between the type of physicians practicing in the FFS and capitation models, we used the propensity score matching to decide which FFS physicians to include in the analysis and to which capitation physicians to match them. The matching was done using the following physician-specific covariates, all measured as of fiscal 2008/9: age, sex, residence in Toronto Local Health Integration Area, number of annual services, visits, patients, days of work, the number of enrolled patients, and the average patient complexity. Given the propensity scores, we then re-estimated our main model using the propensity scores as weights. We have also estimated the un-weighted main model which limits the sample to physicians with propensity scores between 0.4 and 0.8. These results are presented in the accompanying supplementary data Appendix and indicate that our results are robust to this specification test. Second, and similar to the propensity score matching for physicians, we have use the patient-specific matching based on age, sex, residence in Toronto Local Health Integration Area, number of annual services and visits, physician fees for services provided, number of visits to Emergency Department, number of hospital admissions, and length of in-patient stay. Again, using the estimated propensity scores, we have re-estimated our main model using these scores as weights and also the un-weighted model which limits the sample to patients with propensity scores between 0.4 and 0.8. These results are presented in the accompanying Appendix, and again, indicate that our results are robust to this test. Lastly, we examined the probability of de-enrolment by reasons for not remaining enrolled (i.e. at physician request, at patient request, for other reasons). The results of this analysis, presented in the Appendix, show no evidence of a structural break in the 12-month period following the initial enrollment.

6. Discussion and conclusions

The capitation model for primary care physicians in Ontario is designed in part to address the issue that enrolled patients are not limited to seeking care from their enrolling physician only. Specifically, the model includes an ex-post fund that penalizes physicians whenever their enrolled patients seek care elsewhere. Because the size of this penalty is limited, which effectively limits the risk of patients' outside use, the model provides physicians with partial insurance against the risk of enrolling higher than expected cost patients.

The impact of these non-standard features on the risk selection behavior of physicians has not yet been studied extensively. In an earlier study [11], we showed that capitation physicians in Ontario enroll patients with expected primary care expenditures similar to those of patients enrolled with FFS physicians. To some extent, this is not surprising because the patient selection is not expected to occur along observable and contractible dimensions of patients' health, such as age and gender, which are used to risk-adjust capitation payments in Ontario. In this study, we employ a much stronger test of risk selection using the incentive to enroll and care for complex and vulnerable patients. This incentive is both financially significant, equal to about three times the regular capitation rate, and temporary, ending after the first year of enrollment, which

Table 2
Results by patient primary care expenditure (PCE) during the first year of enrollment.

Variable	Parameter from Eq. (1)	Enrollment		Share of PCE		Enrollment		Share of PCE	
		Positive access bonus	No access bonus	Positive access bonus	No access bonus	Below average cost	Above average cost	Below average cost	Above average cost
Constant	γ_0	0.8689***	0.6211***	0.717***	0.2901***	0.799***	0.8284***	0.6365***	0.5951***
		(0.0033)	(0.0097)	(0.0064)	(0.0131)	(0.0109)	(0.0101)	(0.014)	(0.0109)
Trend	γ_1	−0.014***	−0.029***	−0.009***	−0.019***	−0.021***	−0.015***	−0.006***	−0.011***
		(0.0011)	(0.0026)	(0.0015)	(0.0028)	(0.0016)	(0.0011)	(0.0019)	(0.0012)
Trend × after	γ_2	0.0025	0.0193***	0.0039	0.0177***	0.0107***	0.0033	0.0068	0.0045
		(0.0019)	(0.0041)	(0.0034)	(0.0055)	(0.0027)	(0.0022)	(0.0053)	(0.0032)
After	γ_3	−0.0186**	−0.0165	−0.0007	0.0966***	−0.0104	−0.034***	−0.0189	0.0261
		(0.0087)	(0.0163)	(0.0201)	(0.0284)	(0.0109)	(0.0102)	(0.037)	(0.0173)
Trend × capitation	γ_5	0.0049***	−0.0041	0.0033*	0.0014	0.0078***	−0.0003	−0.0025	0.0028**
		(0.0013)	(0.0036)	(0.0019)	(0.0039)	(0.0017)	(0.0014)	(0.0018)	(0.0013)
Trend × capitation × after	γ_6	**−0.0033**	**0.0079**	**−0.0002**	**−0.0035**	**−0.0046**	**−0.00004**	**−0.0028**	**0.0018**
		(0.0024)	**(0.0055)**	**(0.0042)**	**(0.0076)**	**(0.0031)**	**(0.003)**	**(0.006)**	**(0.0039)**
Capitation × after	γ_7	**0.0181***	**−0.0034**	**−0.0148**	**0.0236**	**0.0132**	**0.028****	**0.0303**	**−0.0066**
		(0.0101)	**(0.0228)**	**(0.025)**	**(0.0393)**	**(0.0125)**	**(0.0134)**	**(0.0406)**	**(0.0225)**
Observations		52,178	13,830	19,814	6576	33,578	32,430	8820	17,570
Patients		2425	649	2363	643	1545	1529	1482	1524

Notes:
All the models include patient fixed effects. The sample for enrollment includes all the patients enrolled using Q053 in fiscal years 2009/10 and 2010/11, excluding those who deceased during the period or those with multiple Q053 claims, with monthly observations limited to 24 after the enrollment. The sample for the share of PCE (primary care expenditure) includes the same sample as the enrollment sample, except that it is limited to months when the patient is enrolled with the same physician who claimed Q053 and provided the patient received any services in the given month. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The coefficient γ_4 from Eq. (1) is absorbed in the fixed effects. Figures in bold represent the main coefficients of interest.

provides an ideal setting in which to search for evidence of risk selection behavior over time. However, we find no evidence of either patient 'dumping' or cost shifting. Therefore, the combined evidence from these two studies highlights the need to re-examine the conventional wisdom about risk selection in capitation models that limit physician risk through an ex-post fund, such as the blended capitation model in Ontario. Other results in the literature (e.g. [1]) also demonstrate that a capitation model with an appropriately designed ex-post fund may significantly reduce, if not eliminate, the risk selection problem. Clearly, in addition to the ex-post fund, there are many other factors that influence risk selection behavior such as physician professionalism, altruism, and an established doctor-patient relationship.

There are three main limitations to our study. First, the study focuses on a relatively small group of patients and physicians and it is not clear whether these results are generalizable to the larger population. Future research using larger samples of patients and physicians may explore the external validity of these results. Second, this study examines the continuation of patient enrollment and provision of services after the patient has been enrolled and the CV incentive has been removed. Therefore, it remains for future research to examine the risk selection behavior of physicians at the time of enrollment. Third, we examined the physician response up to 12 months following the removal of the CV incentive. Therefore, our results represent the short-term impact and future research will confirm whether this effect persists in the longer term.

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